Solutions to Quiz 9

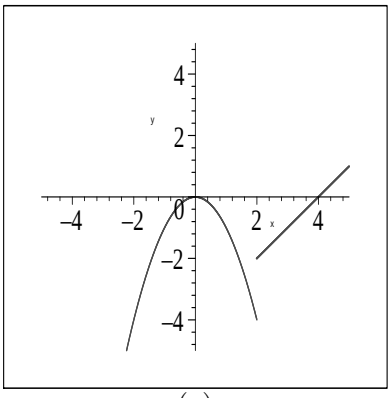
MATH 139-01 and -02
Tuesday, October 7, 2003

Be sure to **show your work**. Unsupported answers receive no credit.

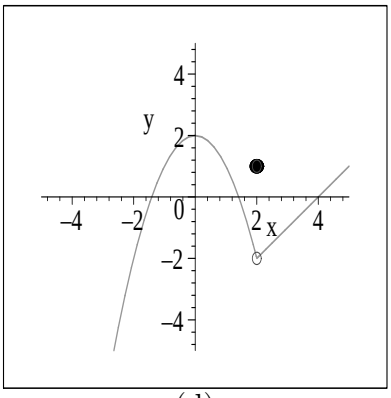
1. Determine whether each function is continuous at $x = 2$. State in each case whether it is or it isn't continuous at $x = 2$.

   (a) $f(x) = x^2 - 4$

   (b) $f(x) = \dfrac{1}{x^2 - 4}$



(c)



(d)

Solution: (a) is continuous everywhere because it is a polynomial. (b) is not continuous at $x = 2$ because it is not defined at $x = 2$. (c) is not continuous at $x = 2$ because $\lim_{x \to 2} f(x)$ does not exist. (d) is not continuous at $x = 2$ because the limit value and the function value are different.

2. Use the definition of the derivative to show that the derivative of $f(x) = 3x - 2$ is 3.

   Solution:

$$\begin{aligned} f'(x) &= \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \\ &= \lim_{h \to 0} \frac{[3(x+h) - 2] - [3x - 2]}{h} \\ &= \lim_{h \to 0} \frac{3x + 3h - 2 - 3x + 2}{h} \\ &= \lim_{h \to 0} \frac{3h}{h} \\ &= \lim_{h \to 0} 3 \\ &= 3. \end{aligned}$$